Orthopantomograph® OP100 D
Orthoceph® OC100 D

Service Program Manual

For sw. 1.4.11

and sw. 1.4 13

09/2002 64515-4AA

INSTRUMENTARIUM imaging

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The original language of this manual is English.

Instrumentarium Imaging reserves the right to revise this publication from time to time and to make changes in the content of it without obligation to notify any person of such revision or changes.

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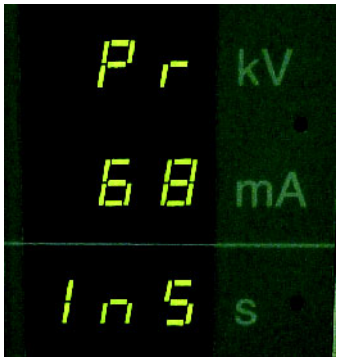
1 Service programs

1.1 General

Orthopantomograph® OP100 D is software controlled diagnostic panoramic dental x-ray equipment for producing high quality digital images of dentition and TM-joints.

Software is divided into two parts. User programs **("Pr")** are accessible by the user and they have features for configuring the unit for daily use and for changing technique factors to optimize image quality.

Maintenance & Service programs **("Sr")** are for technical people for installation and service. Tools are required to access "Sr" programs.



This manual covers the features of the **"Sr"** programs OP100 D software version 1.4.11. Please refer to the *OP100 D User Program Manual V1.4.11* for **"Pr"** program features.

Letters "Pr" or "Sr" in the kV display indicate that the unit is in the programming mode. Numbers 50 to 68 and 70 to 89 in the mA display indicate the actual numeric code for each program. Letters in the exposure time display indicate the mnemonic explanation for each program, to remind the user of the actual numeric program code meaning.

After you have set OP100 D for Service mode, different service programs can be selected by pushing up and down keys, until the desired service program code appears on the display. The display indicates the service program in the following form:

Display	Value(s)	Description
kV	Sr	The unit is in the service mode, and the serviceman is able to use the service programs to test the unit.
mA	70 - 89	Indicates the actual numeric code for respective service program. View the functions with up and down keys and select with OK key.
s	Scr, IOC, EPS, PUP, Prh, FrE, SUPro-, LI-, CE-, ro=, LI=, roc, LIc, COP	Indicates the alphanumeric short form for the explanation of the service program, to remind the serviceman what the numeric program code means.

The displayed service program can be activated by pushing the OK key. After activating the service program the test starts. In programs which require movements and / or exposure, the test starts when pushing the exposure button.

OK

Pas / Err

After completing the test the text “PAS” in time display indicates that the unit passed the test, or respective failure code “Err” indicates that the test failed. Repeat the service program or select a new one.

1.2 Exhibition mode

From software version 1.2.07, the OP100D does not emit x-rays, when the OP100D has been set for exhibition mode. Exhibition mode is selected, when CPU option switch S2 is set “ON” or option jumper X 11 is set to “ON”.

1.3 SR: general purpose test programs

GENERAL PURPOSE TESTS REFERENCE TABLE	
Sr 70 cr	SCROLL EEPROM CONTENTS Scroll the failure code counters and the exposure counters of the CPU EEPROM.
Sr 74 IOC	INPUT / OUTPUT Operation of CPU input and output signals is monitored and displayed with control panel's LED's.
Sr 75 EPS	EXPOSURE WITHOUT MOVEMENTS Exposure without imaging movements (the stepping motors don't operate).
Sr 76 PUP	WARMING UP SEQUENCE Tube warming up procedure.
Sr 77 Prh	PREHEAT ADJUSTMENT Automatic preheat adjustment.
Sr 78 FrE	AEC FREQUENCY MONITORING Program displays AEC Board frequencies in time display during the exposure or standby.
Sr 79 SUP	LINE VOLTAGE DISPLAY Displays the line voltage continuously.
Sr 89 COP	COUNTRY OPTIONS Remote exposure only, Disable Ceph Collimator, Disable AEC, Free kV-mA values, Select ceph mA, Ortho Zone, Ortho TMJ and Ortho Trans

1.4 SR: movement test programs

MOVEMENT TESTS REFERENCE TABLE	
Sr 80 ro-	ROTATION MOVEMENT DYNAMICS Rotation movement test in two directions, no exposure.
Sr 81 LI-	LINEAR MOVEMENT DYNAMICS Linear movement test in two directions, no exposure.
Sr 82 CE-	CEPH MOVEMENT DYNAMICS Ceph movement test in two directions, no exposure.
Sr 83 ro=	ROTATION SMOOTHNESS WITH ACCELERATION Rotation movement exposure test, and rotation / focal alignment verification.
Sr 84 LI=	LINEAR MOVEMENT SMOOTHNESS WITH ACCELERATION Linear movement exposure test.
Sr 86 roc	ROTATION SMOOTHNESS WITH CONSTANT SPEED: Rotation movement exposure test, and rotational / focal alignment verification.
Sr 87 Lic	LINEAR MOVEMENT SMOOTHNESS WITH CONSTANT SPEED: Linear movement exposure test.

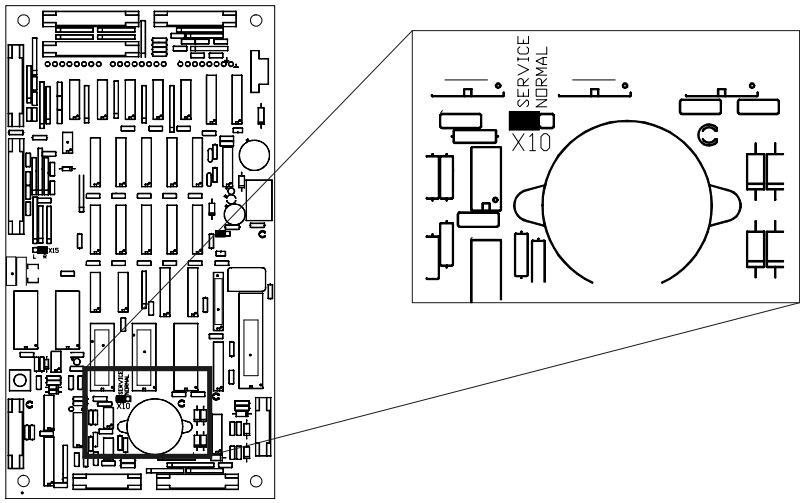
NOTE

Movements without exposure are indicated in time display with " - ", movements with acceleration with " = " and movements with constant speed are indicated with " c ".

1.5 How to use "sr" features

Switch the OP100D power off. Remove the Frankfort light knob located beside the mirror. Open the side doors and remove the mirror cover by undoing the screws. Lift the cover away.

Locate the 3-pin connector X10 and a 2-pin jumper under the program memory circuit on the CPU board. Pull out the jumper and insert it to the left pins. OP100D is now in "SERVICE" mode.



NOTE

If the jumper is not installed, CPU resets continuously and red LED H2 is blinking while power is on.

Begin the programming. Switch the OP100D power on. Wait for a moment. Software version is displayed during the memory check. The display test will run and numbers from 0 to 9 change on the display. Check that all digits are lit. **“ Sr 75 EPS “** is displayed.

Select one of the **“ Sr “** programs. Use up and down keys to view programs , press OK key to select.

Make the trouble shooting, adjustments or change settings. Use arrow keys to select option and settings. Follow the guidelines for each **“ Sr “** program described in the next chapter.

Store any changes to the OP100 D memory. Press OK. **“PAS”** is displayed and all indicators are lit. The same program, eg. **“Sr 75 EPS”**, is displayed again.

NOTE

If the message “Sy 26 EEP” is displayed, the storing of any changes failed. Please contact your dealer.

While the OP100 D power is on, you can move between **“ Pr “** user program settings and **“ Sr “** service program settings, when needed. Press OK for a while. Beep is heard and one of the user programs is displayed, eg. **“ Pr 50 LAY “**. Make changes and store them with OK. Press OK again for a while. Beep is heard and one of the user programs is displayed, eg. **“ Sr 75 EPS “** again.

Exit from service programming. Switch OP100 D power off. Reinsert jumper X 10 to the right. Refit the mirror cover and Frankfort light knob.

2 Service program “SR” features

2.1 SR 70 SCR: scroll eeprom contents

View the CPU parameter memory (EEPROM) contents. This memory stores the failure code counters and cumulative exposure counter values and this information can be used for obtaining OP100D history data. Some failure counters have have non-zero values at the time of installation. This is normal.

Select the program **“ Sr 70 SCR “** and press OK. View memory contents by pushing the left and right keys. KV display shows the memory location and mA/s displays show the contents, if any. Table shows different parameters stored, typical values are shown in parenthesis:

SR 70 SCR: SCROLL MEMORY CONTENTS	
kVmA (value)s (value)	**Memory contents(Typical value)**
14 or 46 **	Last Failure (Sy) or Error (Er) code number, except Er 40 CPU, Sy 26 EEP and Sy 20 ***. (no error)
15 or 47 ** ***	Failure code counter for CPU failures: Er 40 CPU, Er 41 CPU and Er 42 CPU (0)
16 or 48 ** ***	Failure code counter for line voltage failure Ch 05 *** . (0)
17 or 49 ** ***	Failure code counter for wait-state warning Sy 20 ***. (0-10)
18 or 50 ** ***	Failure code counter for tubehead thermal switch Sy 21 Hho. (0-2)
19 or 51 ** ***	Failure code counter for tubehead failure Sy 22 *** (0)
20 or 52*****	Failure code counter for inverter failure Sy 23 Inu (0)
21 or 53*****	Failure code counter for filament failure Sy 24 FIL (0)

SR 70 SCR: SCROLL MEMORY CONTENTS	
kVmA (value)s (value)	**Memory contents(Typical value)**
22 or 54 ** ***	EEPROM write cycle counter. Indicates the total number of write cycles from “Sr” and “Pr” programs written with “OK” key. (200+)
23 or 55 ** ***	Exposure counter value, resetted in program Pr 61 CLC. (0)
24 or 56 ** ***	CPU non-resetable total exposure counter . (200+)
25 or 57 ** ***	Number of exposures since last service call. Value can be resetted in program Pr 59 PSE. (200+)
26 or 58 ** ***	Arcing counter. Counts single arcs and after 5 arcs increments Sy 22 *** counter. (10+)
27 or 59 ** ***	Exposure count limit, set in Sr 71 PAy

NOTE

After 10,000 write cycles to the EEPROM the kV display shows numbers 46 to 59 indicating a new memory bank: 14 -> 46, 15 -> 47 etc.

Exit this program. Press OK key again. **“ Sr 70 SCR “** is displayed again. Select another program or exit service programs.

OK

2.2 SR 74 IOC: cpu input output check

This program is used for checking the state of the CPU inputs and outputs - without opening all the covers of OP100D main assemblies. It is useful for trouble shooting CPU input signal problems, eg. the various microswitches and opto couplers.

The program shows whether the signal from some particular switch reaches the CPU or not. The output signals are somewhat arbitrary, but the information may be useful in some situations.

Select **“ Sr 74 IOC “** and press OK. KV display shows “ In “ for input testing and time display shows “ 0 “ for first test, and the respective port.

OK

Use arrow keys to select different tests (0 to 5) and to select input “ In “ or output “ Ou “ test.

Some of the Program selection LED’s on the Control panel are lit showing the state of the signal port; LED 1 (standard panoramic program) being bit 0 of the port and LED 2 (child panoramic) being bit 1 etc.

Use the tables of the input and output signals with the corresponding I/O port and bit. Use CPU Board schematics to follow signals and refer also to other volumes of the Service Manual for various microswitch states.

Note that the control panel display will be updated with a delay. This should be understood when interpreting movements and other output signals. Stop the movement by pressing any key to see the correct output status.

After testing return to the program viewing level. Press OK key again. “ Sr 74 IOC “ is displayed again. Select another program or exit service programs.

Sr 74 IOC, Input test “ In 0 “ Cephalostat and Linear Movements		
LED	Signal name	Description (Status, when LED on)
1	EEDO	EEPROM data out. Do not care.
2	cephLIMSW	Cephalostat movement detector board.(at start/end position)
3	cephMIDSW	Cephalostat movement detector board (in the middle position)
4	LINLIMSW	Linear (Y) movement limit switch S16 or S17. Switches are connected in parallel. (Switch triggered in end position)
5	LINMIDSW	Linear movement middle switch S15. (Switch triggered)
6	(IN)	Not used, LED not lit
7	(IN)	Not used, LED not lit
8	(IN)	Not used, LED not lit

Sr 74 IOC, Input test “ In 1” Patient Positioning Panel Keys		
LED	Signal name	Description (LED lit when key pressed)
1	ZUP	Vertical carriage UP button
2	ZDOWN	Vertical carriage DOWN button
3	HOME (LEFT)	Left patient positioning button, if panel installed on left side
4	HOME (RIGHT)	Right patient positioning button, if panel installed on right side
5	PROJTRIG	Projector light button
6	PATWARD	Posterior layer correction button / Move linear movement away from the column
7	CENWARD	Center layer correction button
8	PILWAR	Anterior layer correction button / Move linear movement towards the column

Sr 74 IOC, Input test “ In 2 “ Mains Voltage, Exposure, Cephalostat, Option		
LED	Signal name	Description (LED on)
1	MAINS	110/230 VAC selection on the power supply board. This is the switch S4 or jumper connector depending on board version (110 VAC)
2	EXPSW	Exposure switch (pressed)
3	CEPHDOWN	DOWN button on the cephalostat (pressed)
4	CEPHUP	UP button on the cephalostat (pressed)
5	COL1SW	OCD collimator: microswitch S31 (PAN).OP collimator: grounded
6	COL2SW	OCD collimator: microswitch S32 (CEPH) or OP collimator: SQA (QA Filter) grounded
7	(IN)	Not used, LED not lit
8	OPTIONSW	Switch X 11 or S2 on the CPU board. (Exhibition mode)

NOTE

OC100 collimator switches order: QA, PAN, CEPH

Sr 74 IOC, Input test “ In 3 “ Generator Signals		
LED	Signal name	Description (LED on)
1	MAOK	Tube current OK. LED should be off
2	KVOK	Tube voltage OK. LED should be off
3	TEMPFAIL	Tube head temperature switch (switch opened with Sy 21 Hho error message)
4	TUBEFAIL	Tube head high voltage breakdown. (no breakdown)
5	(IN)	Not used, LED not lit
6	(IN)	Not used, LED not lit
7	(IN)	Not used, LED not lit
8	(IN)	Not used, LED not lit

Sr 74 IOC, Input test “ In 4 “ Movement & Cephalostat		
LED	Signal name	Description (LED on)
1	START	START button from the left or right patient positioning panel (pressed)
2	SIDE	START button from the left side patient positioning panel pressed
3	CEPHL	No cephalostat or cephalostat on the left side (ceph on the left)
4	CEPHR	No cephalostat or cephalostat on the right side (ceph on the right)
5	(IN)	Not used, LED not lit
6	(IN)	Not used, LED not lit
7	(IN)	Not used, LED not lit
8	(IN)	Not used, LED not lit

Sr 74 IOC, Input test “ In 5 “ Remote exposure, Vertical & Rotation Movement		
LED	Signal name	Description (LED lit)
1	(IN)	Not used
2	(no name)	Remote exposure button (pressed)
3	ZMIDSW	Vertical carriage height limiting microswitch S 4 (switch triggered at limiting area)
4	ZLIMSW	Vertical carriage limit microswitch S 5 (switch triggered at end position)
5	ROT1SW	Rotation movement position switch S 11
6	ROT2SW	Rotation movement position switch S 12
7	ROT3SW	Rotation movement position switch S 13
8	ROT4SW	Rotation movement position switch S 14

Sr 74 IOC, Output test “ Ou 0 “ Motor Control Signals		
LED	Signal name	Description (LED on)
1	XDIR	Not used (stand-by)
2	XENA	Not used (stand-by)
3	ROTDIR	Rotation movement direction (stand-by)
4	ROTENA	Rotation movement enable (stand-by)
5	CASENA	Not used (stand-by)
6	CASDIR	Not used (stand-by)
7	LINENA	Linear movement enable (stand-by)
8	LINDIR	Linear movement direction (stand-by)

Sr 74 IOC, Output test “ Ou 1 “ CPU Board Internal Signals		
LED	Signal name	Description (LED lit)
1	EECS	Do not care (stand-by)
2	EESK	Do not care (stand-by)
3	EEDI	Do not care (stand-by)
4	WRDFS	Do not care (stand-by)
5	(OUT)	Not used (stand-by)
6	(OUT)	Not used (stand-by)
7	(OUT)	Not used (stand-by)
8	BEEPER	CPU board beeper (stand-by)

Sr 74 IOC, Output Test “ Ou 2 “ Generator D/A Converter Data		
LED	Signal name	Description(LED’s will change all the time)
1	KVMA0	Data bit 0
2	KVMA1	Data bit 1
3	KVMA2	Data bit 2
4	KVMA3	Data bit 3
5	KVMA4	Data bit 4
6	KVMA5	Data bit 5
7	KVMA6	Data bit 6
8	KVMA7	Data bit 7

Sr 74 IOC, Output test “ Ou 3 “ Patient Positioning Panel LED		
LED	Signal name	Description (LED lit)
1	(OUT)	Not used (stand-by)
2	(OUT)	Not used (stand-by)
3	(OUT)	Not used (stand-by)
4	(AEC1)	Not used (stand-by)
5	(AEC2)	Not used (stand-by)
6	PATLED	Patient positioning panel posterior layer correction button LED (no LED)

Sr 74 IOC, Output test “ Ou 3 “ Patient Positioning Panel LED		
7	CENLED	Patient positioning panel center layer button LED (no LED)
8	PILLED	Patient positioning panel anterior layer correction button LED (no LED)

Sr 74 IOC, Output Test 2 Ou 4 “ Generator Control Signals		
LED	Signal name	Description (LED lit)
1	PREHREL	Filament enable (stand-by)
2	PREH	Preheat (stand-by)
3	RG1	Generator input power relay (stand-by)
4	RG	Generator input rectifier capacitor charging resistor bypass (stand-by)
5	EXPON	High voltage enable (stand-by)
6	KVMASEL	D/A converter select (stand-by)
7	KVMACLK	D/A converter clock (stand-by)
8	(OUT)	Not used (stand-by)

Sr 74 IOC, Output test “ Ou 5 “ Projector Lights, Vertical Movements		
LED	Signal name	Description (LED lit)
1	PROJLIT	Projector light enable (lights off)
2	RACKDIR	Not used (stand-by)
3	RACKENA	Not used (stand-by)
4	ZDIR	Vertical carriage movement direction (up)
5	ZENA	Vertical carriage movement enable
6	(OUT)	Not used (stand-by)
7	(OUT)	Not used (stand-by)
8	(LASLIT)	Not used (stand-by)

2.3 SR 75 EPS: exposure without movements

WARNING

This special program generates x-rays.

Exposure without movements. Stepping motors do not operate during the exposure cycle. This program can be used while doing electrical troubleshooting or calibration. User program “ PR 68 INS “ has the same features as this Service program.

NOTE

When this program is used, the KVOK and MAOK signals are not monitored. Therefore Sy 23 Inu and Sy 24 FIL error codes are not enabled. Only Sy 22 *** error code is monitored.

Procedure:

Select “ **Sr 75 EPS** “ and press . Preselected technique factors are displayed.

Select the technique factors, kV, mA and exposure time. Make the exposure. Unit can be operated, but there are no imaging movements during the exposure.

NOTE

If this program is used to align cephalometric beam, make sure that OC100D is positioned in User mode for cephalometric exposures (Program 5 -> ceph collimator -> movement button) before entering this program.

After the exposure the unit is ready for additional exposures.

Return to the program viewing level. Press key again. “ Sr 75 EPS “ is displayed again. Select another program or exit service programs.

2.4 SR 76 PUP: warming-up procedure for tubehead

WARNING

This special program generates x-rays.

Purpose of this program is to enable testing of a defective tubehead assembly, or warming up procedure of the replacement of tubehead assembly.

Procedure:

Select program “ **Sr 76 PUP** “. Make the exposure. OP 100 D exposes with the lowest kV / mA values.

Repeat the exposure. No wait between the exposures is necessary. The next exposure can be taken right after the previous one. kV / mA starts rising automatically from 20 kV / 1 mA, one step after each 3.2 s exposure, until 85kV / 12mA is reached:

Sr 76 PUP: kV & mA Feedback Reference Voltages				
kV	mA	s	(VkVref)	(VmAref)
20	1.0	3.2	(1.00 V)	(0.24 V)
30	1.0	3.2	(1.50 V)	(0.24 V)
40	1.0	3.2	(2.00 V)	(0.24 V)
50	1.0	3.2	(2.50 V)	(0.24 V)
54	1.0	3.2	(2.70 V)	(0.24 V)
57	1.0	3.2	(2.85 V)	(0.24 V)
60	1.0	3.2	(3.00 V)	(0.24 V)
63	1.0	3.2	(3.15 V)	(0.24 V)
66	1.0	3.2	(3.30 V)	(0.24 V)
70	1.0	3.2	(3.50 V)	(0.24 V)
73	1.0	3.2	(3.65 V)	(0.24 V)
77	1.0	3.2	(3.85 V)	(0.24 V)
81	1.0	3.2	(4.05 V)	(0.24 V)
85	1.0	3.2	(4.25 V)	(0.24 V)
85	2.0	3.2	(4.25 V)	(0.49 V)
85	2.5	3.2	(4.25 V)	(0.61 V)
85	3.2	3.2	(4.25 V)	(0.78 V)
85	4.0	3.2	(4.25 V)	(0.97 V)
85	5.0	3.2	(4.25 V)	(1.22 V)
85	6.4	3.2	(4.25 V)	(1.56 V)
85	8.0	3.2	(4.25 V)	(1.94 V)
85	10.0	3.2	(4.25 V)	(2.43 V)
85	12.0	3.2	(4.25 V)	(2.92 V)

Complete one exposure by each technique factors listed above. In case of arcing and / or breakdown, start this test from the beginning (by pushing the “OK”-button twice).

If an arc or high voltage breakdown occurs in the tubehead during exposure, this program is terminated and an “Err” failure code will appear on the display.

When the complete Warming-up procedure has been accomplished, a message “PAS” will appear on the time display.

If repetitive arcing and/or breakdowns occurred, consult Instrumentarium Imaging Technical Service.

NOTE

It is also recommended that the OP100D, which has not been used for 3 months or more, should be warmed up with this program. Always run this program after the tube head assembly replacement.

OK Return to the program viewing level. Press OK key again. “ **Sr 76 PUP** “ is displayed again.

After the test set the OP100D for normal operation and make a panoramic exposure (Program 1) with maximum technique factors.

2.5 SR 77 PRH: Preheat automatic adjustment

WARNING

This special program generates x-rays.

Purpose of this program is to make the unit to adjust it’s preheat level of the filament automatically.

Procedure:

Select the program Sr77Prh and push the exposure button continuously. Unit makes an exposure with 85 kV.

Preheat level starts to rise from 0 by increasing preheat reference slowly, and the unit checks the mA level at the same time. The preheat reference data is displayed in the time display. High number indicates low reference.

NOTE

After the exposure the preheat value which is normally between 190 and 200 appears on the display.

OK When the desired mA level is reached, program terminates the exposure. Press OK to store the current preheat reference into the EEPROM memory.

“ PAS “ appears to the time display accordingly after the program has been completed. If “ Err “ was displayed, try again.

OK Return to the program viewing level. Press OK key again. “ Sr 77 PRH “ is displayed again. Select another program or exit service programs.

2.6 SR 78 FRE: AEC frequency display

WARNING

This special program generates x-rays.

Purpose of this program is to verify the calibrated frequency of the PAN AEC terminal Board by monitoring the AEC frequency and during the exposure. User program “ **Pr 68 INS** “ has the same features as this program.

This program eliminates the need of oscilloscope or frequency counter when adjusting frequency of the AEC. It is also used to calibrate the AEC terminal Board, refer to OP100D Technical Support Manual for more details on AEC calibration.

Procedure:

Select program “ **Sr 78 FrE** “. Technique factors 73kV and 12mA should be selected and time display shows ---.--.---.

Make exposure and response frequency (signal AECFRQ) from AEC terminal Board appears on time-display (unit kHz).

NOTE

If there is no filtering (eg. Al calibration tool missing) between THA and CCD sensor, the displayed frequency might increase rapidly resulting to zeros on display.

This frequency can be adjusted from the PAN AEC terminal board. Refer to OP100D Technical Support Manual section “AEC Calibration Procedure” for details.

Return to the program viewing level. Press OK key again. “ Sr 78 FRE “ is displayed again. Select another program or exit service programs.

OK

2.7 SR 79 SUP: line voltage display

Line voltage is monitored by measuring the incoming +25V supply in the Filament Control Board. Measured line voltage is shown on the time display.

Procedure:

Select program “ Sr 79 SUP “. The display shows the approximate line voltage value:

Inaccuracy of Line Voltage Measurement

Inaccuracy of Line Voltage Measurement	
230 VAC Line	110 VAC Line
± 5 VAC	± 3 VAC

OK Return to the program viewing level. Press OK key again. “ Sr 79 SUP “ is displayed again. Select another program or exit service programs.

2.8 SR 80 RO-: rotation test without exposure

Purpose of this program is to check that there is enough torque in the rotational movement: the stepping motor and motor control circuit operate properly, there is enough friction and the movement does not slip nor get stuck. Rotation test can be done in clockwise - counterclockwise and vice versa.

Procedure:

Select program “ Sr 80 ro- “. Movement test is activated by pushing the exposure button.

Movement is driven from start to end by varying speed. Then the movement is driven from end to start by constant, slow speed, and at the same time the CPU checks whether the pulse count of the stepping motor remains the same, to detect whether some pulses were lost during accelerative movements.

Display shows the actual rotation in degrees, from “ 0º “ to “ 200º “ and back. Note that figure “ 1.5 “ indicates that the motor is loosing pulses during acceleration that correspond to 1.5º rotation, and “ -1.5 “ indicates that the drive mechanics is sliding during braking sequence that correspond to 1.5º rotation.

OK Press OK key. “ PAS “ or “ Err “ message appears to the time display accordingly after the program has been completed. Test tolerance is ± 1 % or ± 2º.

If the test failed and “ Err “ was displayed, check the microswitches, friction surface, drive wheel and its tension, stepping motor and its driving circuitry, cable C 13 inside the rotating unit.

OK Repeat the test when needed or return to the program viewing level by pushing OK key again.

2.9 SR 81 LI-: linear movement test without exposure

Purpose of this program is to check that there is enough power in the linear movement: the stepping motor and it’s drive operate properly, and the movement does not get stuck. This test can be done in two directions: towards the column and back or vice versa.

Procedure:

OK Select program “ Sr 81 LI- “. Enter the program by pushing the OK button untill the unit stops beeping. Movement test is activated by pushing the exposure button.

Movement is driven from start to end by varying speed. Then the movement is driven from end to start by constant, slow speed, and at the same time the CPU checks whether the pulse count of the stepping motor remains the same, to detect whether some pulses were lost during accelerative movements.

Display shows the actual linear movement travel (in mm) of “ 0 “ to “ 60 “ and back. Note that a figure “ 0.4 “ indicates that the motor is loosing pulses during acceleration that correspond to 0.4 mm travel, and “ -0.4 “ indicates,

that the drive mechanics are sliding during the braking sequence corresponding to the 0.4 mm travel.

Press OK key. “ PAS “ or “ Err “ message appears to the time display accordingly after the program has been completed. Test tolerance is ± 2 % or ± 1.2 mm.

OK

If the test failed and “Err” was displayed, check the microswitches, alignment of the fly wheel, linear actuator and linear plate, stepping motor and its driving circuitry.

Repeat the test when needed or return to the program viewing level by pushing OK key again.

OK

2.10 SR 82 CE-: ceph movement test without exposure

Purpose of this program is to check that there is enough power in the ceph movement: the stepping motor and it’s drive operate properly.

Procedure:

Select program “ Sr 82 CE- “. Enter the program by pushing the OK button untill the unit stops beeping. Movement test is activated by pushing the exposure button.

OK

Movement is driven from start to end by varying speed. Then the movement is driven from end to start by constant, slow speed, and at the same time the CPU checks whether the pulse count of the stepper motor remains the same, to detect whether some pulses were lost during accelerative movements.

Display shows the actual ceph movement in mm, from “ 0 “ to “ 260 “. Total travel is 260 mm. Note that figure “ 0.5 “ indicates that the motor is loosing pulses during acceleration corresponding to 0.5 mm travel, and “-0.5” indicates that the drive mechanics is sliding during braking sequence corresponding to 0.5 mm travel.

Press OK key. “ PAS “ or “ Err “ message appears to the time display accordingly after the program has been completed. Test tolerance is ± 1mm.

OK

If the test failed and “ Err “ was displayed, check the microswitches or opto couplers, friction surface, drive wheel and its tension, stepping motor and its driving circuitry.

Repeat the test when needed or return to the program viewing level by pushing OK key again.

OK

2.11 SR 83 RO=: rotation test with exposure & acceleration

CAUTION

This special program generates x-rays.

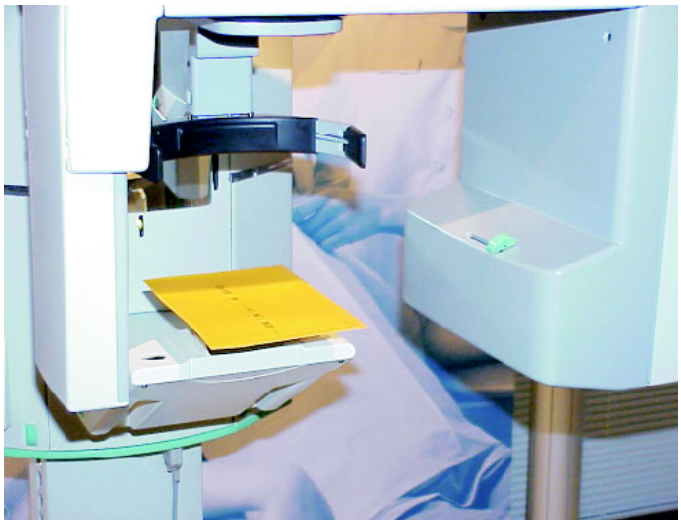
Purpose of this program is to check the smoothness of the rotation movement, and that there are no stripes in the image because of vibrations.

Procedure:

OK

Select program “ Sr 83 ro= “. Enter the program by pushing the OK button untill the unit stops beeping. Maximum technique factors are displayed.

Install an x-ray film (in a cardboard sheet or envelope) horizontally on top of the chin support. Mark the film orientation by bending the envelope from the corner. Use some weight over the envelope.



Rotate by hand to see that the cassette holder or the tube head assembly does not touch the film.

Use technique factors displayed or select new ones. Unit will start about 40 kV lower than this initial setting, raise kV’s and lower again to compensate film density due to the changes in movement speed.

Make the exposure by pushing the exposure button.

Process the film and check that there are no sharp stripes. Some vague stripes may be seen. An excellent film is all gray. Repeat the test when needed.

Return to the program viewing level by pushing OK key again.

OK

2.12 SR 84 LI=: linear movement test with exposure & acceleration

CAUTION

This special program generates x-rays.

Purpose of this program is to check the smoothness of the linear movement, and that there are no stripes in the image because of vibrations.

Procedure:

Select program “ Sr 84 LI= “. Enter the program by pushing the OK button untill the unit stops beeping. Initial technique factors, eg. 66/8.0/4 are displayed. Actual values displayed will dedend on the Pr 52 CCO contrast and density settings for imaging program P1.

OK

Install a loaded cassette, or envelope test film, vertically on top of the chin support. Notice the tube side. Use tape to secure the cassette.

Use technique factors displayed or select new ones. Unit will start about 40 kV lower than this initial setting, raise kV’s and lower again to compensate film density due to the changes in movement speed.

Make an exposure by pushing the exposure button.

Process the film and check that there are no sharp stripes. Some vague stripes may be seen. An excellent film is all gray.

Return to the program viewing level by pushing OK key again.

OK

2.13 SR 86 ROC: rotation test with exposure & constant speed

CAUTION

This special program generates x-rays.

Purpose of this program is to check the smoothness of the rotation movement, and that there are no stripes in the image because of vibrations.

Procedure:

OK Select program “ Sr 86 roc “. Enter the program by pushing the OK button untill the unit stops beeping. Technique factors 85/12/100 @ 230 VAC (85/8/100 @ 110 VAC) are displayed. Light is blinking on time display.

Install an x-ray film (in a cardboard sheet or envelope) horizontally on top of the chin support. Mark the film orientation by bending the envelope from the corner.

Use technique factors displayed or select new ones. Exposure time is fixed 10 s, the number in time display, eg. “100” is used to set the motor speed. A smaller number corresponds to faster speed and vice versa. Make an exposure by pushing the exposure button.

NOTE

The exposure will terminate prior to set time if the movement hits the mechanical limit.

Process the film and check that there are no sharp stripes. Some vague stripes may be visible.

Return to the program viewing level by pushing key again.

2.14 SR 87 LIC: linear movement test with exposure & constant speed

CAUTION

This special program generates x-rays.

Purpose of this program is to check the smoothness of the linear movement, and that there are no stripes in the image because of vibrations.

Procedure:

OK Select program “Sr 87 LIc”. Enter the program by pushing the OK button untill the unit stops beeping. Technique factors 73/12/100 @ 230 VAC (77/10/100 @ 110 VAC) are displayed.

Install a loaded cassette vertically on top of the chin support.

Use technique factors displayed or select new ones. Exposure time is fixed 5 s, the number in time display, eg. “100” is used to set the motor speed. A smaller number corresponds to faster speed and vice versa. Make an exposure by pushing the exposure button.

NOTE

The exposure will terminate prior to set time if the movement hits the mechanical limit.

Process the film and check that there are no sharp stripes. Some vague stripes may be visible.

Return to the program viewing level by pushing OK key again.

OK

2.15 SR 89 COP: country options

Seven country option programs, which are one time settings to configure the unit for daily operation. There are four options that can be selected for: Remote exposure only “1 rE”, disable first cephalostat collimator “2 C1”, no AEC for OP 100 used in computerized radiography “3 nA” and free kV selection in steps of 1 kV “4 FE”.

Sr 89 COP: COUNTRY OPTIONS

Program	Option	Function
1 rE	OFF	Exposure from Control Panel and Remote Exposure button.
	on	Remote Exposure only with AEC and Manual mode . Test mode from Remote Exposure button and Control Panel.
2 nA	OFF	Normal operation with AEC.
	on	No AEC. OP100 CR models without AEC. Denies the AEC operation. Allows OP 100 CR to be used without AEC in phosphor plate digital imaging.
3 FE	OFF	KV and mA selected in pairs according to Pr 52 CCO settings.
	on	Free Exposure Selection. Selection of 57 - 85 kV in steps of 1 kV in Manual Mode and mA selection from the table: 2.5 - 3.2 - 4.0 - 5.0 - 6.4 - 8.0 - 10 - 12 - 16.
4 P3	OFF	Wide Layer Panoramic Program P3.
	on	Password -> Ortho Zone Panoramic Program P3 with enhanced lateral TMJ views and very wide anterior layer view.

Sr 89 COP: COUNTRY OPTIONS		
5 OL	OFF	Lateral TMJ Imaging programs P8.
	on	Password -> Optional Axial corrected Ortho TMJ optional imaging program.
6 3D	OFF	No function, future use.
	on	No function, future use.
7 Or	OFF	No function, future use.
	on	No function, future use.

Procedure:

Select program “ Sr 89 COP “.Enter the program by pushing the OK button untill the unit stops beeping. Press OK. Displays show “ 1 “ and “ rE “ and time display shows “ OFF “ or “ on “. The kV/mA light is blinking.

Select one of the country option programs “ 1 rE “, “ 2 C1 “, “ 3 nA “ or “ 4 FE “ by pressing right or left arrow keys. These four programs are all the time available.

If you have the correct password, one of the additional options comes visible: “ 5 P3 “ for Ortho Zone, “ 6 P6 “ for Ortho TMJ or “ 7 P11 “ for Ortho Trans.

Change the setting of the respective program in displays by first pressing down key. Light in the time display is blinking. Press right key to activate this feature. “ on “ is displayed.

Press left key, if you don’t want this feature. “ OFF “ is displayed.

Press OK to store any changes into OP 100 memory. OP 100 will light all indicators and display “ PAS “ momentarily and then “ Sr 89 COP “ again.

1 rE (OFF/on):

Prevents the exposure from control panel during exposure cycles in AEC and Manual modes. When selected, the exposure is initiated with remote exposure button only. This feature has no affect in Test mode or in Service Mode.

2 nA (OFF/on):

No AEC. Disables AEC function. OP 100 can be used without AEC Board, eg. OP 100 CR models for computerized radiography with a special image plate system do not have AEC.

3 FE (OFF/on):

Free selection of kV values in Manual mode regardless of the nominal factor selection path (= Pr 52 CCo). This feature has no effect on the AEC mode and on preprogrammed technique factors. and mA can be selected from the fixed table (2.0, 2.5, 3.2, 4.0, 5.0, 6.4, 8.0, 10, 12, 16).

In Manual mode kV can be selected in steps of 1 kV. When the led indicator for kV/mA values is lit, first kV display is blinking. Select kV value by pressing right or left keys.

NOTE

Pressing the key longer causes kV to change in larger steps.

Then press down key. MA display is blinking. Select the mA value.

NOTE

Cephalostat has fixed mA value.

NOTE

If the kV is increased with maximum mA selection, the mA value is automatically decreased when the product of kV * mA exceeds the allowed X-ray tube rating.

4 P3 (OFF/on):

Use “ SR 73 LOC “ to enter the password. If the password was correct, Ortho Zone can be activated by selecting “ on “ or deactivated by selecting “ OFF “. If the password was incorrect, one cannot access this option.

5 OL (OFF/on):

Use “ SR 73 LOC “ to enter the password. If the password was correct, Ortho TMJ can be activated by selecting “ on “ or deactivated by selecting “ OFF “. If the password was incorrect, one cannot access this option.

6 3D (OFF/on):

Use “ SR 73 LOC “ to enter the password. If the password was correct, OTACT can be activated by selecting “ on “ or deactivated by selecting “ OFF “. If the password was incorrect, one cannot access this option.

7 Or (OFF/on):

Use “ SR 73 LOC “ to enter the password. If the password was correct, Ortho Trans can be activated by selecting “ on “ or deactivated by selecting “ OFF “. If the password was incorrect, one cannot access this option.

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